

ON LITHOTOMY CONSIDERED AS A CAUSE OF DEATH:

WITH REMARKS ON THE PRESENT STATE OF THE OPERATION,

USUALLY CALLED THE

RECTANGULAR OPERATION FOR STONE;

AND ON THE BEST METHOD OF EXTENDING THE ORDINARY INCISIONS
IN THAT OPERATION, FOR THE PURPOSE OF EXTRACTING
STONES OF UNUSUALLY LARGE SIZE.

MEMOIR READ BEFORE THE MEDICO-CHIRURGICAL SOCIETY OF GLASGOW.

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ON LITHOTOMY, &c.

THE subjects comprehended in the above title, although quite distinct, yet admit well of being discussed together, as the first determines the two last. To point out the paths in which there is danger, is an indirect mode of indicating the safe path; so if we point out the circumstances and conditions in which the operation of lithotomy causes death, we can readily deduce by a process of exclusion both the ordinary operation, which can be performed without danger, and the safest rules for modifying it in circumstances of unusual difficulty.

It is probably in the knowledge of most of the gentlemen who now hear me, that somewhat more than a dozen years ago (in 1846), I introduced into surgical practice at our hospital a new mode of cutting for the stone; which my colleagues at the hospital have done me the honour to adopt almost unanimously, and which has, indeed, been very generally adopted by all those who have had the opportunity of seeing it performed, and knowing the very favourable results that have followed from it. I have, in consequence, not only felt it as a natural ambition, but as a duty imposed upon me, to watch the new operation with the utmost care, and to add to my own observations those of the intelligent men by whom I have the privilege of seeing it performed, so as to render it, as much as possible, worthy of the preference which they have shown it. It is to a few of those observations that I now propose to direct your attention.

It is most gratifying to me to be able to report, in the first place, that the new operation has been attended with a great saving of human life. The average number of deaths has not been more than 1 in 12 persons operated on; while, in persons submitted to the lateral operation, the general average is 1 death in 6. In other words, one half of the persons operated on, according to the old process, and dying, are saved by the adoption of the new one. That this is a fair general average at the present moment will appear from the following considerations. It is founded on upwards of three-score of cases. These have been cut by ten different operators, all of them performing the new operation once for the first time—some of them, indeed, men of large experience in the old operation, as well as in operations of every kind, while others have only entered upon the profession since the new operation came into existence, having become acquainted with it as

students. Farther, the duty of the assistant, who holds the staff, is both more difficult and more important to the success of the operation, than in the old mode of operating. But the operators are not allowed to select, or at least out of courtesy are not in the habit of selecting their own assistants, but take whatever colleague is assigned to them by the course of his election; and this has sometimes been to their own great embarrassment, and the imminent danger of their patients. We must consider, also, that the period from which this average is deduced, comprehends the earliest records of the operation, from the time when it first issued from the dissecting-room, and passed into the operating theatre; and that the rules of the operation, as first performed, have been repeatedly altered in conformity with the suggestions of a wider experience. If these various circumstances be taken into account, I think I shall not be accused of being over-sanguine, when I venture to predict a much higher success for the operation hereafter, than it has hitherto attained. I think, indeed, it may be fairly anticipated that the time will come when, in our hospitals at least, no man will die of the operation for stone in the urinary bladder, unless either the stone be of large size, or there are unusual risks to be run from an anomalous distribution of the arteries, or from the existence of disease in the prostate or bladder. Now, as such cases constitute only a small per centage of the total number of cases of stone in the bladder, not above one, or at most two per cent., it is reasonable to hope that the success of the operation for stone in the bladder will gradually approximate to the same average.

It is not, however, this bright side of the picture, but the opposite side exhibiting the cases that have terminated fatally, that I intend at present to bring prominently under your view. We often learn most from our unsuccessful cases. The only compensation we receive for the regret which they occasion to us, is when they teach us useful lessons for our future guidance. It is thus, indeed, that many of the greatest triumphs of Medicine have been achieved; defeats to her become the preludes of victory, and her enemies themselves teach her to subdue them.

Since the introduction of the new operation in 1846, there have been six cases in which the performance of it has been followed by death. I shall speak of these cases numerically, in the order in which they occurred. In all of them an examination of the body after death was made. I witnessed the examination in cases 2, 3, 4, and 6. I shall therefore speak most fully of these four; but I know enough of the other two cases, viz., 1, and 5, to be able to speak of their general features of resemblance or dissimilarity to the cases with which I am better acquainted.

The first five cases, I believe, all died of the same affection; that is, of the same pathological condition of the body immediately

induced by the operation. I shall speak, however, as stated above, chiefly of 2, 3, and 4; and only in the way of comparison of 1, and 5. I wish particularly to draw attention to the great rapidity of the fatal affection induced; to the peculiarity of the symptoms by which it was marked, and the resemblance of these symptoms to each other in all the cases; and, lastly, to the very remarkable, and altogether identical appearances, which the dead bodies presented on dissection.

The first fatal case occurred in the hands of one of the most eminent surgeons of this or any country, an original and most zealous member of our Medico-chirurgical Society, whom we have all regretted to miss from our meetings this session, and who—alas! that I should have to say it—will never again cheer us with his countenance, or gladden our ears with his well-known voice; and will never again, as he has so often done within this hall, instruct us by drawing from the rich stores of his long experience and well-matured reflection. I need not say to you that I speak of Dr. Lawrie. I am proud this evening to be the bearer of one last sheaf of his, to be added to the full harvest which he has garnered. I have not the advantage of knowing what Dr. Lawrie ultimately thought of the case I am about to describe; perhaps, his thoughts were not, like mine, kept rivetted upon it by the occurrence of other cases equally disastrous; but I shall speak of it with the utmost freedom and openness, using it as if it were my own, just as I know he would wish me to do if he were here present to hear me.

The patient was a strong young man of 23 years of age. There was nothing remarkable in the operation; but as there was more novelty in such cases then than there is now, I paid the man a visit in the evening to see how he was doing. A single glance was sufficient to show that the man was in a most dangerous condition. He tossed from side to side in his bed, and could find relief in no position in which he could place himself; his countenance was anxious, his voice weak, and his pulse rapid and fluttering. He complained of no pain, but of sickness and exhaustion. The belly was a little tumid; but there was no tenderness to the touch. Death took place in somewhat more than twenty-four hours.

The appearances that presented themselves on dissection were such as created the astonishment of all who witnessed them, as being altogether unexpected, and such as not one of us had ever seen or heard of, as occurring after the operation for stone. The whole upper and posterior surfaces of the urinary bladder and the parts adjacent were of an intensely red colour, arising from ecchymosis; and the redness was much more intense on the right side than on the left, contrary to what we thought likely to happen. On turning up the bowels, there was found on each

side of the abdominal cavity a small quantity of a sanguinous fluid. There was no inflammatory state of the peritoneum, nor any redness, except in the situation which I have indicated.

No one could look at these very remarkable appearances without having the idea immediately suggested to him, that this man had been stabbed in the lower belly. My friend Dr. Easton, whose practised eye, from the official position which he had long occupied, was familiar with the appearances left in the dead body by deeds of violence, happening to stand by me during the dissection, he whispered into my ear—"that the case was exactly like one of his." So much, indeed, was I at a loss to form any rational conjecture as to these anomalous appearances, that I was driven into the unjust suspicion that our great operator had allowed his knife to slip out of the groove of the staff, and had wounded the posterior part of the bladder; but the most careful search failed to discover any such wound.

The two next cases may be described in the very words I have employed above, in so far as essentials are concerned, the only difference being that the patients died by my hands instead of by Dr. Lawrie's. They were both in the same excellent health before the operation. The affection induced proceeded with the same frightful rapidity, and exhibited the same symptoms; and the appearances, on dissection, were quite identical—the same ecchymosis of the surface of the bladder and adjacent parts of abdomen, and the same small quantity of bloody fluid in the peritoneal cavity.

One of the patients (3) was a fine boy, four years of age. At the commencement of the operation, as often happens with children, the rectum was protruded to such an extent, and so forcibly, that there was difficulty in returning it; I therefore held it with my left hand, which it completely filled. This was, I believe, the cause of the boy's death; for as my left hand was occupied in holding the protruded bowel, I was unable to put my index finger into the rectum, which, as the operation was then performed, was a rule perfectly indispensable to performing it properly. At that period the staff was not, as at present, held in the vertical position, so that the groove may be horizontal; on the contrary, it was generally held inclined over the pubes, so as to make the angle of the staff project visibly in the perineum. Hence the necessity of the forefinger of the left hand being kept in the rectum, to ascertain the exact degree of inclination of the groove of the staff. In the hurry of the moment I forgot this indispensable rule. The knife was carried straight forward into the bladder, dividing the prostate, and the stone was at once extracted. It was thought a brilliant operation, but my heart returned no echo to the plaudits of the amphitheatre. On carrying my finger into the bladder, after withdrawing the knife, it crossed the groove of the staff at an

angle, and I felt certain that I had killed my patient. I was, unfortunately, unable to visit him for twenty-four hours. He had passed the previous day and night in great uneasiness, his countenance was anxious, his pulse rapid and feeble, and the abdomen tumid but little painful. It was obvious he could not survive long, and he died in thirty hours after the operation. On examining the body, the ecchymosis was found to be somewhat less in degree, but occupied the same situation, only it was equally diffused on both sides. The bloody fluid was found in the same situation. The only difference consisted in there being in the very middle of the small bowels a fine rose-red circular patch of inflammation, which was not more than an inch, or an inch and a half in diameter, and contrasted strikingly with the ordinary colour of the peritoneal surface around it. This seemed to me to be the commencement of an intense phlogosis, which would have been developed had the patient lived longer.

The other case (4) was that of a boy thirteen years of age. The stone was found to be of larger size than could easily be extracted by the aperture first made; and, therefore, the bilateral section was performed. This boy was long of recovering from the chloroform which had been administered to him, and it is difficult to say whether it did or did not conspire to accelerate his fate. He died in about twelve hours—great uneasiness, restlessness, sickness of stomach, and a rapid feeble pulse being the most marked symptoms which he presented. To these must be added severe shivering fits, which were observed also in other fatal cases. I have seen the same symptom, in a still more remarkable degree, in cases where I had a suspicion the incisions had not been quite correctly made, but which recovered, so that there was more time for observation. The shiverings were violent and long-continued, and recurred for several days, being followed by profuse sweating or by purging, which seemed to resolve the attack. On examining the dead body, in Case 4, the ecchymosis was found to be more extensive than in either of the former cases, occupying not only the surface of the bladder and its neighbourhood, but stretching up along the whole of the rectum and a part of the sigmoid flexure of the colon, where it terminated abruptly by a well-defined line. The bloody fluid was present as before.

Of the fifth case (5) I am unable to give any history in detail. The patient was an adult. The stone, which was of the mulberry kind, of large size and of irregular shape, required much force to be employed in extracting it. The patient died in about twenty-four hours. Of the dissection, I have only learned that there was great redness of the lower belly, and more than the usual quantity of bloody fluid.

Of the first case (1) I can likewise say little. The patient was eight years of age, and died, with symptoms of great depression, in

about twenty-four hours. The symptoms and course of the disease were therefore similar, but the appearances on dissection were different. No examination of the body could be obtained at the hospital, but, by the commendable zeal of Mr. Watt, permission to examine it was at length obtained from the parents at their own house. I am, however, unable to say any more than that there was no redness within the abdomen.

The sixth case seems to me to belong to a different category from any of the former. The man was twenty-five years of age, and had laboured under symptoms of calculus from an early period of his life. It was ascertained, by examination from the rectum while the sound was in the bladder, that the stone was of very large size. The man was therefore kept in the house a considerable period to give time for experimental trials on the dead body, of the method recommended below, of enlarging the incision of the prostate and bladder directly upward. This plan was afterwards carried into effect. After the usual rectangular incision had been made, without any attempt at extraction, the incision upward was performed. It was still found impossible to remove the stone. The bilateral section, first of the external parts, and next of the prostate, was then made, and the stone was found to admit of being removed through the doubly enlarged aperture. The stone was of the mulberry kind, rough and nodose, and of a shape nearly spherical, which, in proportion to its size, demands the largest aperture for its extraction.

Notwithstanding the severity of this operation, the man lived four days, but in a very feeble and exhausted state. On the second day the belly began to swell, especially at its upper part. After death there was no ecchymosis of either the bladder or rectum, and no effusion. The bowels were distended from tympany, but showed very little, if any, increased vascularity. The bladder was large, very much thickened, and its mucous coat rough, from red projecting processes all round the neck, where it seemed to have been adhering to the stone.

Having thus laid a sufficient foundation on which a discussion may be raised, I now put the question—"Of what did these six patients die?" I think no one will hesitate in returning for answer, that they all died of the injuries inflicted by the operation—that they died of their wounds just as certainly as if they had perished on the battle-field of Alma, or beneath the walls of Sebastopol. But the operation for stone, performed as here recommended, is, fortunately, not always a fatal operation. In the great majority of cases it is a very trifling one. What, then, is the cause of this difference? Why are certain operations for stone trifling or devoid of danger? and why do other operations imperil life, and even destroy it?

To simplify the subject as much as possible, we shall abstract

from our consideration all accessory causes of danger, such as disease of the bladder or prostate; and restrict our inquiry to the causes of death when the operation is performed on organs not unsound, and on persons in good general health—conditions very frequently combined in cases of stone in the urinary bladder.

There are, according to my views, four causes which render the operation for stone in itself dangerous or fatal. These are—
 1. Infiltration of urine into the subserous cellular tissue of the peritoneum, and the passage of it through that membrane, by osmosis or simple percolation, into the interior of the peritoneal cavity. 2. Infiltration of urine into the subfascial cellular tissue of the pelvis, while all access to the peritoneal cavity is debarred by the dense fibrous membrane. 3. Mechanical contusion of the bladder and parts adjacent, of which what is called *shock* is the most severe form. And 4. Hemorrhage.

1. It may be objected to this arrangement that the two first causes are comprehended under the general expression *infiltration of urine*. But it is the very generality of that expression, as employed to indicate a cause of death after lithotomy, that renders it objectionable, from its being ambiguous and devoid of definite meaning. Infiltration of urine is not in itself a cause of death, for it occurs after every operation for stone, but only infiltration in certain situations; and unless these situations are specified, no accurate idea has been expressed. That mere infiltration of urine is not a cause of death, we have evidence in what we see occur every day in urinary abscesses, or effusion of urine under the superficial fascia of the perineum. That the urine must be largely absorbed after such effusion is certain, but we never see any bad effect thence resulting; nor apprehend anything more than the local mischief arising from the irritant action of the urine, which occasions sloughing of the cellular tissue, and that may be so severe and extensive as to cause death, especially if not mitigated by incisions. Such external effusions warn us what must be the extreme danger of effusions of urine proceeding inwardly into situations where there is no possibility of its escaping, and where it comes into contact with parts more susceptible of irritation. Still, however, the affections induced, whether by external or internal effusion, proceed alike from a local irritation. But such affections are so totally dissimilar in respect of the symptoms which they exhibit and the course which they run, according to the seat of that irritation, that no man who has any pretension to scientific accuracy in his discrimination of diseases can possibly confound them together; which is clearly done when they are referred indiscriminately to infiltration of urine.

The two forms of urinary infiltration, which become causes of death after lithotomy, take place in consequence of special errors in the mode of cutting for stone, which it is most important to

signalize. The first kind of infiltration has been observed chiefly after the rectangular operation, and was, indeed, never diseriminated as a distinct affection till that operation came into use. It may, however, oecur readily after the common lateral operation; after which, however, the second form of infiltration more frequently presents itself. These specialities depend upon the particular errors into which the operator is most apt to fall in adopting these respective modes of operating.

The six eases, described above, present no illustration of the second kind of infiltration, and all of them but one seem to me to be instances of the first. Of these eases, I have described minutely the appearances that presented themselves after death in the second, third, and fourth. The two first of them, notwithstanding the care with which I examined and reflected over them, completely baffled me, and left my mind in a state of utter perplexity and darkness with respect to their true nature: the only point which admitted of no doubt as to both, being that the patients had been, in some unascertained and mysterious way, stabbed in the lower belly. It was only on examining the third ease that daylight broke in upon me, and gave me a glimmering idea of the probable nature of them all. An accidental circumstance, which I have mentioned above, first put me upon the right path. The eechymosis described above, terminating in a well-defined line on the sigmoid flexure of the colon, attracted my attention. The blood forming it had obviously come from below. I traced it all round the rectum, where that intestine is covered with peritoneum, and beyond the reflection of the peritoneum I found the blood extending downward, between the rectum and bladder, as far as the external wound. The source of the blood was thus obvious. From the external wound it had made its way into the cellular tissue between the bladder and rectum, till it reached the reflection of the peritoneum (recto-vesical pouch), and thence, following the course of that membrane, it had been diffused alike over the bladder on the one side, and the rectum and colon on the other.

But granting this to be the true origin of the blood, it will be said that blood is an innocuous fluid; and that the effusion of blood under the peritoneum never could give rise to the grave symptoms under which those patients laboured. It must, however, be considered that wherever blood passes, a more subtle and penetrating fluid will pass more readily and extensively. The urine, therefore, with which the surface of the wound after lithotomy is continually bathed, entering by the same aperture as the blood, will diffuse itself in the cellular substance between the bladder and rectum, and will thence make its way into the sub-serous tissue behind the peritoneum covering the parietes and viseera of the abdomen. But will it stop behind the peritoneum?

Assuredly not. It will pass through that membrane by osmosis, or by simple percolation, and will enter the peritoneal cavity. That the sanguinolent fluid, which was in four out of five of these cases found in the cavity of the abdomen, consisted of urine holding the colouring matter of the blood in solution, I entertain no doubt; although it was not proved to be so by chemical tests. But if urine be effused into the cavity of the peritoneum, it will produce the same effects, whether it enter by the circuitous route just described, or be directly effused from a rupture of the urinary bladder. Now the known effect of the effusion of urine, of bile, or of the contents of the alimentary canal into the peritoneal cavity, is death in about twenty-four hours; and I refer to the same cause the fearfully rapid death that takes place after a badly performed rectangular operation for stone.

Such is my view of these rapidly fatal cases, and there seem to me to be two causes of the rapidity of the fatal event. First, the rapidity of the infiltration, taking place from a wound situated immediately beneath the open urethra, along which the urine secreted into the bladder continually passes to be diffused laterally over the cut surface, and the orifice of the open wound beneath the prostate; and second, the circumstance that the urine passing inwardly by a wound beneath the prostate is not confined by any fascial covering, but comes into immediate contact with the peritoneum.

This view of the subject is to my mind, at least, much more probable, as being more consonant with facts and with physiology, than the theory which ascribes to shock all deaths that occur rapidly after lithotomy. How, it may be asked, can such a cause be assigned in such cases as No. 3, in which the whole duration of the operation was less than a minute, and the wound was of small size?

2. In the absence of cases illustrative of the mode in which death takes place after the second kind of urinary infiltration, we must, for the purpose of comparison, borrow the descriptions which have been given of them. The patients, instead of being seriously affected immediately after the operation and dying in twenty-four hours, are described as sometimes appearing to do well for several days, when they rolled round upon their bellies and died in great agony; or, as sometimes surviving for a longer period, with gradually increasing emaciation, or hectic symptoms: while after death there is found purulent infiltration into the cellular tissue of the pelvis or circumscripted abscesses. There is, therefore, a total dissimilarity in these cases to the former, whether we look at the symptoms during life, or the pathological lesions after death. We may infer also from the kind of operation performed, that the wound extending beyond the rim or base of the prostate had divided the deep perineal fascia, or levator ani

muscle, in such a way as to permit the infiltration of urine under the recto-vesical fascia where it lines the sides of the pelvic cavity.

The views stated above as to the cause of the infiltration of urine have a most important bearing upon the operative process in lithotomy. If it be true that the greatest danger of lithotomy arises from urine getting into the cellular space beneath the prostate, or rather between the bladder, prostate, and urethra on the one side, and the rectum on the other, then the great rule for performing lithotomy safely, is to avoid carefully this *hypoprostatic space*, as I shall take the liberty of calling it. This space is inclosed by strong and well-defined boundaries. It lies just beneath the recto-vesical pouch of the peritoneum, and is therefore conterminous with the abdominal cavity, from which it is separated by a thin membrane. It has the bladder, prostate, and a small portion of the membranous part of the urethra in front; the rectum behind; and on each side the recto-vesical fascia, or lateral ligament of the bladder. The vas deferens and the vesiculae lie within it, and it is filled with a delicate cellular tissue, free from fat. When the bladder is folded forward over the pubes, the hypoprostatic space has very much the shape of a four-sided pyramid, of which the apex is truncated, and lies a little below the apex of the prostate. The boundary forming this apex consists of the deep perineal fascia where it intervenes between the urethra and rectum, and forms there the only fibrous septum for the protection of the abdominal viscera. If this septum be divided, while the bladder is at the same time opened, infiltration behind the prostate must necessarily ensue.

It is of great importance, therefore, to study the boundaries of the hypoprostatic space, with the view of determining at what points they are most apt to be violated by the knife of the lithotomist. I am satisfied that the great source of the danger of lithotomy has been generally misunderstood. We may see this in the admonition invariably given to the student and young operator, never to extend his incision beyond the base of the prostate. This admonition, in so far as it represents such an incision as the great source of danger in lithotomy, involves a double error; for there are certain directions in which the base of the prostate may be both safely and advantageously cut; and there are other directions in which a fatal error will be committed, although the gland is not divided half way to the base. The just and true admonition, which I would substitute for the above, is never to do the slightest violence to the fibrous tissues, which form the three planes at the apex and the two sides of the pyramidal space beneath the urethra, prostate, and bladder.

The mode and place in which the hypoprostatic space is laid open, differ in the old operation and in the new. In the latter

the lateralized knife, penetrating too low, divides the deep perineal fascia behind the urethra ; and being thought to be in the groove of the staff, it is carried deep under or through the substance of the prostate into the lax cellular tissue beyond.* The lateral incision to the left side completes the violence inflicted on these delicate parts. The operator now ascertains with his finger that he has not entered the bladder, and rectifies, as he supposes, his mistake, by carrying his knife higher up and dividing the prostate ; but it would be much wiser in such circumstances to send the patient to bed after the first unsuccessful thrust : for the wound, though a severe one, is not yet necessarily fatal, but by the second incision, infiltration of urine into the subserous tissue of the peritoneum and death in twenty-four hours becomes inevitable. This is, I believe, the true explanation of the frightful rapidity of these fatal cases. They constitute a new phase in the history of lithotomy, altogether peculiar to this new operation. Five out of the six fatal cases that have occurred in our hospital have been of this kind, and cases in every respect similar have occurred in private practice. This is now so generally known in this city, that an operator, if his patient is not dead or obviously dying at the end of twenty-four hours, is congratulated on the success of his operation.

There are two other modes in which the hypoprostatic space may be laid open in performing the rectangular operation for stone, which I think it important to signalize. It is well known that in whatever part of the urethra or prostate the angle of the staff be made to rest, that part is protruded in front of the orifice of the groove projecting in the perineum. If, therefore, the operator be not careful to ascertain that the angle of the staff is sufficiently far forward, if he allow it to rest at the back of the membranous portion of the urethra, the deep perineal fascia is folded over the mouth of the groove, and must be divided in entering the groove with the knife ; and if the angle rest on the prostatic portion of the urethra, on the body of the gland, or farther back, a still deeper wound will be inflicted on entering the groove, as it is easy to verify on the dead body.

The third mode in which I have seen the accident happen, is the result of a mode of operating which some operators have tried, but which, as appears to me, is not to be recommended. They make the external incision first, that they may enter the groove of the staff with more facility by a second incision. But in thrusting the knife into the middle of the perineum for the purpose of commencing the first incision, the deep perineal fascia, which is only a few lines from the surface, must be very liable to

* I am aware, it may be urged in opposition to these views, that in the rectovesical operation, and in the operation of M. Nelaton, the bladder is opened from the under part of the prostate ; but the difference of result is probably due to the greater freedom of the outlet for the urine in these operations.

injury, as the knife can enter the middle of the perineum in no way safely unless lodged in the groove of the staff. The wound thus produced may not be very deep, but I have seen the most formidable symptoms result from it—long continued shivering, profuse sweating, and diarrhoea, lasting for several days and causing great anxiety for the patient's safety, although he ultimately did well.

In the lateral operation, from the direction of the incisions they are less apt to do injury to the hypoprostatic space, and cannot do it to the same formidable extent; but that space must be laid open more or less by those misdirected incisions that penetrate into the rectum and injure the vesiculae seminales. It seems to me at least not improbable, that in many of the rapidly fatal cases, death may be owing to this cause rather than to shock, to which it is usually ascribed. The more the incision of the prostate is directed downward, the accident must be the more likely to happen. Perhaps, therefore, we may thus explain the increased mortality after the lateral operation of lithotomy, which seems to me beyond all doubt to have taken place in our own day. Cheselden cut the prostate outward, keeping the edge of his knife turned up. But we have since been recommended, upon high surgical authority, to divide the prostate downward and outward, in the line of the external incision. By following this precept, I cut the rectum in one of my first lateral operations, and I abandoned it ever after, cutting directly outward; now any precept that tends to endanger the rectum will also render the space under the prostate more liable to be laid open.

The importance of the subject must be my excuse for one further reference to anatomy. The hypoprostatic space, as above defined, is divided diagonally from before to behind by that portion of the recto-vesical fascia, which, to avoid the confusion of names, I shall call the *fascia interposita*, from its lying between the rectum and bladder. It comes off from the deep perineal fascia behind the urethra, forms the proper tunic of the lower part of the prostate, and stretches from the base of that gland towards the rectum, in front of which it runs upwards, gradually assuming the characters of mere cellular tissue. When, therefore, the deep perineal fascia has been divided behind the urethra, there are two routes by which the infiltrated urine may reach the peritoneum—the one between the rectum and fascia interposita, which is circuitous and probably less fraught with danger; the other between the fascia interposita and bladder, which to lay it open requires a deeper wound, dividing either the fascia interposita or the substance of the prostate.*

* I have pleasure in acknowledging that for some excellent dissections illustrative of the surgical anatomy of the perineum I have been indebted to my young friend, Dr. George Buchanan, son and assistant of Dr. M. S. Buchanan, the able Professor of Anatomy in the Andersonian Medical School of Glasgow.

3. *Mechanical Contusion of the Bladder and Perineum.*—The sixth case seems to me to be an example of death from this cause. The man seemed never to rally from the shock of the operation ; he continued weak and with a rapid feeble pulse, but he had not the incessant restlessness observed in the other fatal cases. Towards the end of the second day a subacute peritonitis set in, marked chiefly by tympanitis with little vascular injection. After death there was no ecchymosis nor effusion. A train of symptoms quite similar might have followed the extirpation of a tumour near the abdomen, but remote from the urinary bladder, if the operation had been severe. The death was not rapid enough to have been occasioned by effusion of urine into the peritoneum, which the kind of incision probably prevented.

4. *Hæmorrhage.*—As none of the cases sunk from this cause it might have been omitted ; but on account of its importance a few words may be said of it. In a rectangular operation properly performed, it can only take place when there is some anomalous distribution of the bloodvessels. But if the staff be held too high, the bulb and corpus spongiosum of the urethra are doubled over the angle of the staff, and can scarcely escape the knife. A very profuse hæmorrhage may be occasioned in this way.

II. With respect to the best mode of extending the ordinary incisions of the rectangular operation for the purpose of extracting stones of large size, we must take for our guide the preceding considerations derived from anatomy, and the observed results of different modes of incision. We have seen that there is danger in extending the ordinary incisions laterally, and still more downward. In the former way we run the risk of subfascial infiltration of urine, and, in the latter, of the more dangerous form of infiltration into the subserous tissue of the peritoneum. The incision upward is, therefore, all that remains to us. It is clear that if a moderate lateral incision has been first made, above the level of which the urine in the bladder can never rise, there will be no risk of urinary infiltration from an incision upward, even though carried beyond the base of the prostate, for the urine can never come into contact with such a wound. Even without the precaution of a previous lateral incision, Dr. John Thomson recommended the incision upward, and Dupuytren found it to be safe in practice.

The mode in which I perform the incision upward is by means of an instrument, which I name a *finger-director*, which I have for many years past used in cutting for anal fistula. It is a metallic cylinder, tapering from the rounded point to the base, open in front, and fitting like the finger of a glove to the index finger, while the handle attached to the back part of it lies flat upon the back of the hand ; unlike the clumsy rectangular handle of the speculum ani, which, in imitation of the above instrument, has been more recently introduced to answer similar purposes.

For these its structure shows that it was never intended ; and those who know the history of the operation in question are aware that it was never till of late years generally so applied. This tapering cylinder, fitted upon the index finger, enters the wound with the same facility as the index itself ; and the part of it at which its further progress is arrested, gives an accurate measurement of the circumference of the wound of the prostate. The handle of the instrument being now securely held, while the open side of the cylinder is turned upward, the forefinger feels with much nicety the tense fibres stretched over the open groove which require to be divided ; and this is done by one or more incisions with a curved bistoury. The director can now be pushed further in, while an exact measurement of the size of the enlarged internal aperture is given as before. If need be, this incision can be carried beyond the base of the prostate, dividing the bladder to whatever extent may be deemed necessary ; and this, with the lateral incision first made, will allow any stone to be extracted that can pass between the bones and the soft parts over them. After making a sufficient incision upward it is, I believe, never necessary to cut the right side of the prostate, and much safer not to do it. But a bilateral section of the external parts may be required for a large stone, and even a third incision directly upward, or a little to the left of the raphe of the perineum ; thus giving the enlarged external incision a tricuspid form, not unlike a leech bite on a great scale.

III. I conclude by making a few observations on the somewhat singular position which the operation here referred to now occupies in the estimation of medical men and in surgical practice. It is to me a matter of regret that in so doing I shall not be able to exhibit the surgeons of this country under the aspect of a purely scientific body of men.

Had I discovered some new compound in chemistry or devised some new problem in mathematics, how would my labours have been received by the professors of those sciences ? Would the mathematicians have asked whether my problem was wrought out in Glasgow or in London ; and even though my new chemical compound were not of more importance than many of the innumerable compounds of the four cardinal organic elements, would it not have undergone a searching investigation in every laboratory throughout the kingdom, till its true place as a chemical body had been thoroughly ascertained ? How then should it be otherwise with a surgical invention ? Is surgery not a science ? and if it be, why are not the principles of that science paramount to the authority of names ? Why should we have a local surgery, any more than a local mathematics or a local chemistry ?

To show how completely the principles of surgery are in this country, at the present day, subordinate to local prejudices and

the caprice of individuals, I have only to record the history of the rectangular operation for stone. It is now twelve years since an account of it was first published, and for more than one half of that period it has been well known to effect a saving of human life to the extent of one half of all those that undergo the operation for stone, as has been shown from the unquestionable evidence of the records of a public hospital; but, if instead of calculating the result from the admitted average mortality of the operation of lithotomy, we assume as true what is currently reported and believed, that the average mortality in the London hospitals is one out of two, that is, one half of all those that are cut, then would the adoption of this operation be the means of saving *ten* out of every *twelve* persons that now perish after the operation for stone in the metropolitan hospitals. There is here an appeal to humanity, as well as to surgery. How, then, has that appeal been responded to?

By the members of the medical profession in Glasgow, and over the whole district of Scotland connected with Glasgow by education and professional intercourse, the new operation has been received and adopted in practice with the most cordial unanimity. They have, almost to a man, abandoned the old operation and adopted the new one. This they did after seeing the operation performed and judging of it for themselves; and that they judged independently may be inferred from the fact that they did not wait till some high metropolitan authority promulgated his dictum for their guidance. It would, however, be unfair in me not to mention, that the repute of the new operation was greatly advanced by some men of deservedly high name having at an early period given it their countenance—I should particularly mention Dr. Lawrie, Dr. M. S. Buchanan, Mr. Watt, and Dr. Hunter, as among the first to advocate it and adopt it in practice.

Everywhere else throughout this country the new operation has met with a very different reception. With the exception of Mr. Spence of Edinburgh, I do not know of a single hospital surgeon who has ever performed it. I should mention, however, that the late much-lamented Dr. Richard Mackenzie, before leaving Edinburgh for the Crimea, had expressed his intention of adopting it. In private again, the performance of it has almost been limited to the pupils of the Glasgow school disseminated as practitioners throughout the country. Not only has the operation not been adopted—it has been opposed, misrepresented, and ignored—terms scarcely intelligible in reference to a scientific discussion, but unfortunately too frequently applicable to discussions in surgery, which, besides being a science, is also an art and means of making money. But I forbear from drawing a picture which those who love our noble art in its purity and simplicity, and not in its meretricious dress, can have no pleasure in contemplating.

Notwithstanding these unfavourable appearances, I am fully satisfied that the seed which I have committed to the ground is not destined to remain unproductive, but is even now in vigorous growth, and will ere long yield an ample harvest. The signs of this result are to me unmistakable. Twelve years ago, when I first threw a pebble upon its placid surface, the opinion of all medical men in this country on the subject of lithotomy was tranquil and undisturbed. The lateral operation of Cheselden was accepted by all as an ultimate result of surgical ingenuity, and the boldest innovators for half a century before had never ventured farther than to modify the shape of the cutting instrument, or alter slightly the direction and extent of the incisions. How different is the case now! Throughout all England the medical mind is in a ferment on the subject of lithotomy. Every periodical teems with observations and cases innumerable, all indicative of some great change which the public mind is in process of undergoing. And what is that change? It is exactly what I first advocated. All are now thoroughly determined, as determined as I then professed myself to be, to abandon for ever the old homicidal lateral operation for stone. Still further, they are all, without any exception, equally unanimous as to the direction in which the new movement is to be made. It is exactly the direction which I recommended to them. They all try to penetrate into the bladder, directly in the mesial or middle line of the perineum. To be sure they do not do this exactly in the way in which I recommend that it should be done. But that would have been an honour too great for me to expect from metropolitan surgeons, more accustomed to give than to receive instruction. They prefer, not unnaturally, using their old instruments to my new ones. Some of them, however, have gone so far as to take my staff into their hands, and they express their surprise at the facility with which it slips into the bladder. But they do not call it by my name, or by the name which, as the inventor, I was entitled to give it. They prefer calling it, I am afraid less in compliment than in derision, "the Glasgow staff." Some have gone farther, and have actually used the Glasgow staff in their operations. But do not suppose that they have followed my directions as to the mode of using it. They have more spirit. They hold the groove of the staff in the middle of the perineum, or right up against the pubes, as if to deviate as far as possible from the leading maxim of holding it under the level of the bulb of the urethra, which any tyro at Glasgow could prove to them to be indispensable. Last of all, there are surgeons more independent still. They do not use the Glasgow staff. They get a small bit added to either end of it; or better still, they drill a hole right through it, and then they consecrate the new staff by giving to it their own name, so that thenceforward no one can justly say

of them that they use any other staff than their own. If, in fine, they wish to attain the highest distinction—to add the praise of ingenuousness to that of ingenuity—they publish a description of the new staff, while they admit candidly that some man, somewhere in Scotland, did previously devise and use a staff of a somewhat similar description.

The name of Rectangular Operation has been an unfortunate one, as tending to produce confusion in the public mind between the operation and the instrument used in performing it. It is impossible to dispel from the minds of many surgeons, more especially of those who have invented rectangular instruments and wish to use them in their own way, that "rectangular operation" can mean anything else than an operation performed with a staff of a rectangular shape, in whatever position that staff may be held. But to perform the rectangular operation, such as I have described it, the staff must be held in one invariable position, viz., with the groove under the level of the bulb of the urethra; and if the groove be placed in any other position, it is no longer the operation described by me that is performed. It is only when held in this position that the staff will permit the knife to penetrate into the bladder by the shortest possible route, and to cut outward, making a safe and sufficient opening for the extraction of the stone. Whoever operates with a rectangular staff held in the position just described, performs essentially the operation which I recommend, whatever subordinate modifications may be given to the staff. I owe, indeed, and beg to express my thanks, to many ingenious gentlemen who have introduced such modifications, while they retain the essential points of the rectangular shape of the staff, the true position of the groove, and the direction of the section outward. If I have not myself adopted any of the proposed modifications, it is because I have not been able to persuade myself that the simple staff in the hands of a man of ordinary dexterity, duly instructed in the way of using it, is not a superior instrument to any of the more complicated staffs which have yet been constructed, so far as I have seen them. As to those gentlemen again who employ rectangular staffs, whether simple or complicated, held in any other position than that described above, I can only say that I cannot perceive the use which such instruments so held are intended to serve, and that personally I owe them no thanks, but the reverse, for the confusion which they have occasioned in the public mind as to the true nature of the operation which I have named Rectangular.

I must advert more particularly to two operations, in some respects very much akin to my own, which have obtained popularity in England. These are Mr. Allarton's median operation, and Mr. Hutcheson's operation with his rectangular catheter. I may be allowed, without undervaluing the labours of those gentlemen, to urge the similarity and priority of my own.

Mr. Allarton's operation was first given to the public six years after mine—at a period therefore when the practical success of the latter had been fully ascertained. The object of both operations, in so far as incision is concerned, is the same—to penetrate into the bladder in the middle line of the perineum. I first applied the term *mesial*, in contradistinction to *lateral*, as a generic name for all such operations. Mr. Allarton, unwilling apparently to borrow anything from me, with much ingenuity changes two of the letters of this name, and calls his operation “the median operation.” Now, as the one word is just as good as the other, and there is no difference in their signification, little objection could have been made to this change had he contented himself with calling his operation *a* median operation, but to call it *the* median operation, as if no other median operation were in existence, is to arrogate for it a degree of importance not warranted by its priority in point of time, or, as appears to me at least, by its demonstrated excellency.

While mesial, or median if it be preferred, is the generic name according to the nomenclature which I have proposed, the different modes of operating in the middle line are denoted by specific names, indicating in what way the prostate is divided in each of them. If we apply this principle to Mr. Allarton's operation, it ought to be named the *medio-lacerant*, for I believe this term to express truly the mode in which, for the most part, the prostate is actually divided; but if any objection be made to that assumption, the operation might then be called the *medio-dilatory* which would express the double idea of the process of dilatation and the tediousness of that process.

To represent Mr. Allarton's section as a revival of the “*sectio Marianæ*” is manifestly erroneous. Had Mr. Allarton imitated Marianus, he would not have cut in the middle line of the perineum at all, but to the left of it, and would have gone right through the corpus spongiosum and bulb into the canal of the urethra, leaving the membranous part untouched by the knife. Mr. Allarton's section is a much more scientific one, and the offspring of a much later age. So far as I know the history of lithotomy—if we pass over the crude attempts of the Celsian operators, and come down to the time when anatomy had become a science—Dupuytren is the first surgeon who ever attempted to reach the bladder by cutting from the middle line of the perineum through the membranous and prostatic portions of the urethra. To that great surgeon of the last generation—to whom I owe the respect and gratitude of a pupil to his teacher—I willingly professed my own obligations, assuming his bilateral operation as the starting-point of my own researches. But the bilateral operation was not the first mesial operation devised by Dupuytren. At an earlier period of his career he performed the very section now recommended by Mr. Allarton; but he abandoned it on finding

that it was only fitted, even when accompanied with a free section of the prostate, for extracting stones of very small size (*tres-peu volumineux*). There can be no doubt that this is the source from which Mr. Allarton's operation has been actually derived, although he is not himself aware of it. His own account is, however, quite reconcileable with this view. He says he derived it indirectly from Bresciani di Borsa, through the medium of the *Medico-Chirurgical Review*. But the Italian surgeon obviously adopted his section from Dupuytren's first mesial operation, just as he adopted the double lithotome from the second, in all cases where the size of the stone required it. I have thus shown that in object, in name, and in origin, Mr. Allarton's section is very similar to my own—the great difference being that Mr. Allarton operates with the old staff, as I originally did, to the great danger of the rectum and bulb of the urethra, while I operate with a staff especially devised to guard against these dangers.

There are only two steps in Mr. Allarton's section which he claims as altogether his own. These are keeping his finger in the rectum to guide his knife, and using the knife by stabbing as with a dagger, instead of by cutting inward. Now these are the well-known steps of the rectangular operation. From these numerous coincidences, I am satisfied that Mr. Allarton has directly or indirectly profited by my labours more than, if in the former way, he has thought fit to acknowledge, or, if in the latter, than he may himself be aware of.

I hope I have said enough to show that Mr. Allarton has no title to the credit, which is so generally accorded to him all over England, of having introduced the mesial section for stone into this country. Mr. Allarton, as I have above stated, introduced his operation six years after mine, at a period when the practical success of the latter was no longer doubtful. Both operations are taken from Dupuytren—mine directly from his last and most perfect effort, which I have so modified as to render it, I believe, more safe and easy of execution, and more successful in its results; Mr. Allarton's, from an earlier operation which had been abandoned by Dupuytren himself on account of its imperfection, but which was revived by an Italian surgeon who wrote more than twenty years afterwards, and from whom Mr. Allarton indirectly takes it. The subject may be illustrated thus:—The city of Glasgow has just received a supply of pure water from Loch Katrine, the source of the river Forth; now, if six years after this it were proposed to bring in another supply of water into the city—taking it not from the fountain-head, but much farther down, from the turbid stream which meanders beneath Stirling castle—the attempt would be quite parallel to Mr. Allarton's attempt to reintroduce into this country the mesial section for stone.

Although it is only with Mr. Allarton's section, or the first part of his operation, that I have properly anything to do, I cannot

avoid offering a few remarks in passing upon the second part of it,* in which unquestionably he shows himself a genuine disciple of Marianus. One great cause of the slow progress of the human intellect seems to be, the tendency which it has not to advance in a straight line, but to move onward in a kind of spiral curve, which brings it frequently back, after a wide circuit, to some point which it occupied long before. It is impossible to avoid this reflection when we see sensible men emulating each other in devising instruments, for the purpose of renewing, in the last half of the nineteenth century, the barbarities which were the disgrace of surgery three hundred years before. It must be owned, however, that these proceedings are a genuine result of a principle which has long passed, and passes at the present day, unquestioned as an axiom among lithotomists, viz., that the prostate gland is more safely torn than cut. How a proposition so repugnant to common sense, and so inconsistent with our experience of every other tissue of the human body, should have met with a general acceptance with respect to tissues so dense and unyielding as the prostate and its capsule, is difficult to conceive. With whom it originated I do not know; but it has since passed as one of the arcana of lithotomy from one operator to another, and been screened from all general investigation, from the belief that none but lithotomists were capable of judging of it. I think, however, it most probably originated in the following way:—If a knife be pushed through an orange or any similar solid, dividing it in the middle, but leaving it entire at the sides; and if thereafter the finger be forced through the opening—it will be found that a great deal of boring and apparent dilating or tearing is required to allow the finger to pass: but it is merely the effort necessary to change two plane and parallel surfaces into a cylindrical surface capable of adapting itself to the surface of the finger. Now every operator who thrusts his finger into the bladder after cutting the prostate gland, experiences similar sensations, and is apt to imagine that he is dilating or tearing the substance of the prostate, when he is doing no more than adapt the two plane and parallel cut surfaces of the gland to the curvilinear surface of his own finger. Tearing the prostate is something very different; few tissues of the body resist it more powerfully, or would, I believe, be more injured by it. While the prostate ought never to be cut a single hairbreadth beyond what is necessary for the extraction of the stone, it ought, according to my view, to be cut, and not torn to the necessary extent.

Mr. Hutcheson of London, surgeon, I believe, to one of the

* In giving the history of the process of dilatation, Mr. Allarton has not done justice to my friend Dr. M. S. Buchanan of this city, who is unquestionably the first surgeon in this country who practically investigated it. But the result of his investigation has been to make him abandon dilatation in favour of incision to the exact extent necessary, and no farther.

London hospitals, has invented what he calls a rectangular catheter with which he cuts for the stone. Now, had Mr. Hutcheson been a Frenchman or a German, his use of the word catheter would have been quite correct, for in France and Germany a staff is so called; but in England a catheter is one instrument, and a staff is another. A catheter is used for emptying the bladder of water—a purpose for which Mr. Hutcheson does not intend his instrument. A staff, again, is the instrument employed by the lithotomist to direct him in his way into the bladder, which is exactly the use which Mr. Hutcheson makes of his instrument. My controversy, therefore, with Mr. Hutcheson is chiefly a literary one. I must contend that Mr. Hutcheson is wrong in the use which he makes of the term catheter, and that his instrument is not a catheter, but a staff; and that it is neither more nor less than a rectangular staff, with a hole bored through it.

But bad as the name may be, the use which Mr. Hutcheson makes of his instrument is still worse. He directs it to be held in the middle of the perineum. What end can be proposed in holding such an instrument in such a position I cannot conceive, unless it be to render absolutely certain the division of the spongy body and bulb of the urethra, which are doubled over the angle of the staff, and cannot possibly escape the knife. I do not speak of what I have not seen. An eminent surgeon of this city took up at one time the same idea as Mr. Hutcheson, and insisted that his rectangular staff should be held up under the arch of the pubes. I held it myself, reluctantly indeed, but without one word of remonstrance, which I knew would have been vain. Such a gush of blood followed the introduction of the knife as I never before witnessed in lithotomy. It would have been called a flooding in the other sex; but most fortunately, although quite unlooked for by either of us, the bleeding stopped almost completely as soon as the patient was unbound and the staff withdrawn from the urethra.

With respect to the future of this operation, it might, perhaps, be most prudent to allow the future to speak for itself; but having once succeeded in foretelling its success, I am tempted to hazard another prediction. When the operation was yet a mere speculation in the dissecting-room, I had the presumption to anticipate, and say openly, that in ten years the lateral operation for stone would be a matter of history; and in less than half that time the new operation had completely superseded the old one on the only field where they have hitherto come into competition—in this city and around it. I now venture to predict that in less than the period above mentioned, it will be the dominant operation throughout England, counting from the day when the operation shall be first performed in the theatre of a London hospital by a man

who has carefully studied it, and is duly qualified to perform it. In saying this, I am quite aware that while there are prophecies that bring about their own fulfilment, there are others that have an opposite tendency, and may even pervert the natural course of events by the opposition and hostility which they excite. But I know well of what I speak, and have calculated the chances upon both sides. The petty prejudices of individuals by which the operation is now opposed will become every day more feeble, and at length pass away; while what is conformable to truth and to nature is enduring, and will gather every day new strength from every fresh manifestation of its power.

I must, however, be understood to speak solely of England. To those who know Scotland it will not seem strange that a Glasgow invention should find little favour, and should not even be tolerated within the bounds of Mid-Lothian. The example of Mr. Spence, although his operation was successful, never met with a single imitator in Edinburgh; and what is excluded from Edinburgh is excluded virtually from a large part of the ancient kingdom of Scotland. No! I prophesy only of things possible. Dr. Livingstone—a pupil of the Glasgow school—will plant the new operation on the Zambesi and the Shirwa; it will pass the fabled Hydaspes, and penetrate into China and Japan—and perhaps, thereafter, a traveller from those remote regions will reimport it under a barbarous name as the invention of some eastern sage, and then, but not till then, it will find a ready welcome, and become the dominant operation in the capital of Scotland.